



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Thomas G. FERENCE et al.

Serial No.: 09/261,328

Filed: March 3, 1999

For: ULTRA-FINE CONTACT  
ALIGNMENT

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: Examiner: D. Graybill  
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**RESPONSE AND AMENDMENT UNDER 37 CFR § 1.111**

Commissioner for Patents  
Washington, D.C. 20231

Sir:

In response to the Office Action dated December 20, 2000, the following remarks are provided for consideration:

**REMARKS**

Claims 1-53 are pending in the application. Claims 7-9, 19, 21-24 and 26-53 were withdrawn from consideration by the Examiner. It is noted that there is a discrepancy between the claims listed as being withdrawn from consideration on form PTO-326, and the claims listed as being withdrawn from further consideration in the first paragraph of the Office Action dated December 20, 2000. Specifically, the first paragraph of the Office Action lists claims 7-9, 19 and 21-25 as being withdrawn from further consideration. Because claims 1-6, 10-18, 20 and 25 were elected, it is presumed that the claims listed on Form PTO-326 as being withdrawn from consideration is the accurate listing.

Claims 1-8, 10-18, 20 and 25 were rejected under 35 U.S.C. § 102(b) as being anticipated by Akamatsu (US Patent 5,611,481). In view of the above, it is noted that claims 7 and 8 are believed to be withdrawn from consideration by the Examiner.

It is noted that anticipation requires the disclosure, in a prior art reference, of each and every limitation as set forth in the claims. *Titanium Metals Corp. v. Banner*, 227 USPQ 773 (Fed. Cir. 1985). There must be no difference between the claimed invention and reference disclosure for an anticipation rejection under 35 U.S.C. § 102. *Scripps Clinic and Research Foundation v. Genentech, Inc.*, 18 USPQ2d 1001 (Fed. Cir. 1991). In view of the foregoing authority, the cited reference fails to support the asserted rejection.

The present invention as recited in independent claim 1 relates to a semiconductor structure comprising a first substrate and a second substrate joined to the first substrate. The semiconductor further comprises a plurality of contacts between the first substrate and the second substrate, and a plurality of first solder bumps connected between the first substrate and the second substrate for aligning the contacts.

Akamatsu does not anticipate the present invention because, among other aspects, it does not disclose first solder bumps for aligning contacts according to the present invention.

As detailed in the present specification, the first solder bumps, which are typically larger than the contacts, help to align two structures, such as a first and second substrate, such that contacts of the structures will align. Making the first solder bumps larger than the contacts may help to maintain the two substrates separated at a distance sufficient to prevent contact of both substrates by the contacts prior to alignment of the two substrates.

The relationship of the first solder bumps to the contacts is illustrated in Fig. 3, for example, of the present application. The first solder bumps 5 initially separate contacts 7 of an integrated circuit chip 3 from contact pads 11 on integrated circuit chip 1.

The contacts 7 may comprise solder and have a higher melting point than the first solder bumps. This permits the solder of the first solder bumps to melt first and roughly

align the two substrates as shown in Fig. 1B. Then, the temperature may be raised, causing the contacts to melt, resulting in further alignment of the two substrates, and forming a connection between the two substrates, as shown in Fig. 1C.

By contrast, Akamatsu makes no mention of alignment according to the present invention. Rather, as described in the “Summary of Invention” section, Akamatsu is concerned with forming a soldering metal connection between a semiconductor chip and a circuit board which is free from the wettability problem related to the repellency of an aluminum interconnection layer against the melt of soldering metal. Akamatsu is also concerned with forming a soldering metal connection which is free from disconnection failures caused by thermal stress.

In view of the foregoing, it is clear that Akamatsu is in no way concerned with alignment of contacts utilizing a first soldering bump according to the present invention.

More specifically, referring now to col. 3, line 60 to col. 4, line 27 of Akamatsu, cited by the Examiner, a first soldering metal bump 3A has a higher melting temperature than that of a second soldering metal bump 4A. The reason for the first soldering metal bump having a higher melt temperature is apparently in order to maintain a trapezoidal shape of the first soldering metal bump while connecting the first and second soldering metal bumps.

However, any discussion of alignment of contacts using first soldering bumps according to the present invention is completely absent from Akamatsu. As noted above, first solder bumps according to the present invention perform an alignment function which is not present in either of the first or second soldering bumps described in Akamatsu.

With regard to the Examiner’s contention that claims directed to product must be distinguished from the prior art in terms of structure rather than function, it is noted that functional claiming in apparatus claims is common practice and serves to define patentable subject matter. For example, in performing analysis under the doctrine of equivalents for purposes of determining infringement, “[t]o determine whether a claim limitation is met literally, where expressed as a means for performing a stated function, the court must

compare the accused structure with the disclosed structure, and must find equivalent structure as well as identity of claimed function for that structure." *Pennwalt Corp. v. Durand-Wayland, Inc.*, 833 F.2d 931 (Fed. Cir. 1987). Thus, a claimed function can distinguish over prior art. Moreover, there is clearly no identity of function between the solder bumps described in Akamatsu, and the first solder bumps for aligning contacts, as recited in claim 1 of the present application.

Each of claims 2-6, 10-18, 20 and 25 are dependent upon claim 1, and consequently incorporate its features. Thus, these dependent claims are allowable over Akamatsu for at least the reasons described in connection with claim 1.

Accordingly, withdrawal of the rejection of claims 1-6, 10-18, 20 and 25 under 35 U.S.C. § 102(b) is respectfully requested.

Since, in view of the above, the present application is in all aspects in condition for allowance favorable reconsideration and early issuance of a Notice of Allowance is respectfully solicited.

In the event the Examiner believes an interview might serve to advance the prosecution of this application in any way, the undersigned attorney is available at the telephone number noted below.

The Director is hereby authorized to charge any fees, or credit any overpayment, associated with this communication, including any extension fees, to Deposit Account No. 22-0185.

Respectfully submitted,



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